

# APPROXIMATION OF CONVEX FUNCTIONS WITH CUMULANT GENERATING FUNCTIONS

ROLAND HILDEBRAND

ABSTRACT. We show that any convex function  $f$  on the real line or an interval thereof can be approximated in the  $C^0$  norm by the cumulant generating function of a non-negative measure with an error bounded by an absolute constant which does not depend on  $f$ . We give upper and lower bounds on the best of such constants, which equal  $\ln 2$  and  $\frac{\ln 2}{2}$ , respectively. The proofs for these bounds are constructive. As an additional contribution, we show that the considered approximation problem has close links to the quality of a certain sums of squares relaxation and thus to applications in computational mathematics.